Amendments to the Claims:

        1. (Currently amended) A magnetic resonance imaging method comprising:

        acquiring variable density sensitivity encoded data with a higher density at and adjacent a center of k-space and with a lower, undersampled density away from the center of k-space, the higher density portion disposed at or near the center of k-space not being undersampled;

        constructing one or more regularization images from the higher density portion of the variable density sensitivity encoded data disposed at and adjacent the center of k-space, the constructing not including unfolding of folded images; and

        reconstructing the variable density sensitivity encoded data into an unfolded reconstructed image, the reconstructing including:

        reconstructing the higher and lower density variable density sensitivity encoded data into a plurality of folded images, and

        unfolding the folded images to form the unfolded image using the one or more regularization images.

        2. (Currently amended) The magnetic resonance imaging method as set forth in claim **1**, wherein the plurality of folded images are each acquired by a corresponding antenna of a plurality of antennae, and the constructing of one or more regularization images includes:

        reconstructing a low resolution image from the higher density portion of the variable density sensitivity encoded data acquired by each antenna that is not undersampled; and

        combining the reconstructed low resolution images to obtain the regularization image used in the unfolding.

        3. (Canceled)

        4. (Currently amended) The magnetic resonance imaging method as set forth in ~~claim 3~~ claim **1**, wherein the higher density portion of the variable density

sensitivity encoded data <u>that is not undersampled</u> spans about one-eighth of a k-space range of the variable density sensitivity encoded data.

5. (Currently amended) The magnetic resonance imaging method as set forth in ~~claim 2~~ <u>claim 1</u>, wherein the higher density portion of the variable density sensitivity encoded data acquired by each antenna is oversampled and contains redundant data.

6. (Original) The magnetic resonance imaging method as set forth in claim 1, wherein the sensitivity encoded image unfolding includes:

optimizing a penalty function including a weighted combination of:

an unfolding term indicative of fidelity of the unfolded image to the folded images, and

a regularization term indicative of fidelity of the unfolded image to the regularization images.

7. (Original) The magnetic resonance imaging method as set forth in claim 1, wherein the acquiring of variable density sensitivity encoded data includes:

acquiring the higher density portion disposed at or near the center of k-space with a uniform k-space sampling density that is not undersampled; and

acquiring undersampled k-space data away from the center of k-space using a k-space sampling density that decreases smoothly with distance away firm the higher density portion.

8. (Original) The magnetic resonance imaging method as set forth in claim **7**, wherein the sampling density transition between the higher density portion and the undersampled k-space data away from the center of k-space has one of a linear and a Gaussian shape.

9. (Currently amended) ~~The~~ <u>A</u> magnetic resonance imaging method ~~as set forth in claim 1, wherein the acquiring of variable density sensitivity encoded data includes~~ <u>comprising</u>:

acquiring variable density sensitivity encoded data <u>with a higher density at and adjacent a center of k-space and with a lower, undersampled density away from the center of k-space</u> using a non-Cartesian trajectory, the higher density portion of the variable density sensitivity encoded data being defined by a geometry of the non-Cartesian trajectory<u>;</u>

<u>constructing one or more regularization images from the higher density portion of the variable density sensitivity encoded data disposed at and adjacent the center of k-space; and</u>

reconstructing the variable density sensitivity encoded data into an unfolded reconstructed image, the reconstructing including:

reconstructing the higher and lower density variable density sensitivity encoded data into a plurality of folded images, and

unfolding the folded images to form the unfolded image using the one or more regularization images.

10. (Original) The magnetic resonance imaging method as set forth in claim **9**, wherein the acquiring of variable density sensitivity encoded data using a non-Cartesian trajectory includes:

acquiring a plurality of radial k-space sampling trajectories, the higher density portion of the variable density sensitivity encoded data being defined by a convergence of the plurality of radial k-space sampling trajectories at or near the center of k-space.

11. (Original) The magnetic resonance imaging method as set forth in claim **9**, wherein the acquiring of variable density sensitivity encoded data using a non-Cartesian trajectory includes:

acquiring a spiral k-space sampling trajectory, the higher density portion of the variable density sensitivity encoded data being defined by a center region of the spiral k-space sampling trajectory.

12. (Original) The magnetic resonance imaging method as set forth in claim **11**, wherein the spiral k-space sampling trajectory has one of a uniform spiral

pitch and an expanding spiral pitch that increases with distance away from k-space center.

13. (Original) The magnetic resonance imaging method as set forth in claim **9**, wherein the constructing of one or more regularization images includes:

reconstructing a plurality of low resolution images corresponding to radio frequency antennae used in the acquiring from the higher density portion of the variable density sensitivity encoded data, the regularization image used in the unfolding being constructed from the reconstructed low resolution images.

14. (Original) The magnetic resonance imaging method as set forth in claim **9**, wherein the higher density portion of the variable density sensitivity encoded data is not undersampled.

15. (Currently amended) A magnetic resonance imaging apparatus comprising:

a main magnet;

magnetic field gradient coils;

a plurality of radio frequency receive coils; and

a processor that performs the magnetic resonance imaging method of ~~claim 1~~ claim **9**.

16-18. (Canceled)

19. (Currently amended) The magnetic resonance imaging apparatus as set forth in ~~claim 16~~ claim **20**, wherein the unfolding processor optimizes a penalty function including a weighted combination of:

an unfolding term indicative of fidelity of the unfolded image to the folded images, and

a regularization term indicative of fidelity of the unfolded image to the regularization images.

20. (Currently amended) ~~The~~ A magnetic resonance imaging apparatus ~~as set forth in claim 16, wherein the~~ comprising:

a plurality of radio frequency coils ~~acquire:~~ acquiring variable density sensitivity encoded data including:

~~the~~ a higher density portion disposed at or near the center of k-space acquired with a uniform k-space sampling density that is not undersampled, and

undersampled k-space data acquired away from the center of k-space using a k-space sampling density that decreases smoothly with distance away from the higher density portion;

a reconstruction processor that for each coil reconstructs:

a regularization image reconstructed from a higher density portion of the variable density sensitivity encoded data disposed at or near a center of k-space acquired by that coil, and

a folded image reconstructed from the variable density sensitivity encoded data acquired by that coil; and

an unfolding processor that unfolds the folded images, the unfolding being regularized by the regularization images.